From

Applicant: University of California
Filed.   Herewith
Docket.   1133.010WO1
Title: Bryostatins, Bryopyrans and Polyketides:
              Compositions and Methods

COMPUTER READABLE FORM:
          Medium Type·   Diskette
          Computer: IBM compatible
          Operating System: WINDOWS 95
          Software: FastSEQ Version 4.0

Date Recorded: August 3, 2000

INTERNATIONAL PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA et al.
Serial No.:   New Filing
Filed: 04 August 2000   Docket: 1133.010WO1
Title: BRYOSTATINS, BRYOPYRANS, POLYKETIDES:
             COMPOSITIONS AND METHODS

COMMUNICATION REGARDING SEQUENCE LISTING

BOX PCT
Assistant Commissioner for Patents
Washington, D.C.   20231

Dear Sir:

In accordance with Rule 1.821(e) and in compliance with WIPO Standard ST.23, submitted herewith is a copy of the SEQUENCE LISTING in computer readable form, as recited at pages 1- 80 of the above-identified international application also submitted herewith.

It is respectfully submitted that the contents of the paper version of the SEQUENCE LISTING recited at pages 1- 80 and the computer readable version of the same, both of which are submitted herewith, are identical. The enclosed SEQUENCE LISTING has been converted into the ASCII format using the Word(Perfect) conversion tool.

Please direct any inquiry to the below-signed attorney at (612) 373-6900.

Respectfully submitted,

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Date: ___04 August 2000___ By_____

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<110> University of California

5<120> Bryostatins, Bryopyrans and Polyketides: Compositions
        and Methods

   <130> 1133.010WO1

10<140>
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   <150> 60/147,283
   <151> 1999-08-04
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   <160> 38

   <170> PatentIn Ver. 2.1

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   <223> N in this sequence refers to I or insosine

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<223> N in this sequence refers to I or inosine

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gctgggatag cgggcgtgac caaagtattg ttgtctttgc agcatcgcat gttaccaccg 180
acgattcatt gtgaggatgt aaacccacag attgcgttgg aaggtagccc cttttatatc 240
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tcttttggtg tcagt   315

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<213> Endobugula sertula

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            20                  25                  30
5
  Asn Ile Gly His Leu Gly Val Gly Ala Gly Ile Ala Gly Val Thr Lys
            35              40              45


  Val Leu Leu Ser Leu Gln His Arg Met Leu Pro Pro Thr Ile His Cys
10    50                  55                  60


  Glu Asp Val Asn Pro Gln Ile Ala Leu Glu Gly Ser Pro Phe Tyr Ile
  65              70              75                  80


15Asn Thr Glu Leu Lys Pro Trp Gln Ser Gly Asp Gly Ile Pro Arg Arg
              85              90                  95


  Ala Gly Val Ser Ser Phe Gly Val Ser
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<210> 11

<211> 736

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25<213> Endobugula sertula

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30gctgggatag cgggcgtgac caaagtattg ttgtctttgc agcatcgcat gttaccaccg 180
  acgattcatt gtgaggatgt aaacccacag attgcgttgg aaggtagccc cttttatatc 240
  aatacggaat taaagccttg gcagtctggt gacggtatac cacgacgggc tggtgtcagt 300
  tcttttggtg tcagtggtac caatgcacat cttgtattag aagaatatac tcaccgagta 360
  acatcaccat tacaaaatac tattttaccc cagaacggtt tgtttattgt tccactatct 420
35gcaaaaaatg atgaatgctt aaatgcttgt tcgaacgac tgttattttt ctaaaaagc 480
  aggcaatccg atacatataa aaaatattcc ttaagtgata cagctcctat attgttagat 540
  ttagcatata ccctccaggt cagtagggaa gcgatgacaa aacgagttgc ctttgtagtg 600
  aaaacaacaa tagagttaat ggaaaaatta aatgcattta tagaaaaaca aaatactata 660
  aaagcaagta atataaaagg ttgttactac tcttcgacta aaacatcgag tccatttgat 720
40aatgaatcga ctgatc                                                736
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            20   25   30

Asn Ile Gly His Leu Gly Val Gly Ala Gly Ile Ala Gly Val Thr Lys
15   35   40   45

Val Leu Leu Ser Leu Gln His Arg Met Leu Pro Pro Thr Ile His Cys
        50   55   60

20Glu Asp Val Asn Pro Gln Ile Ala Leu Glu Gly Ser Pro Phe Tyr Ile
   65   70   75   80

Asn Thr Glu Leu Lys Pro Trp Gln Ser Gly Asp Gly Ile Pro Arg Arg
                85   90   95
25
Ala Gly Val Ser Ser Phe Gly Val Ser Gly Thr Asn Ala His Leu Val
                100   105   110

Leu Glu Glu Tyr Thr His Arg Val Thr Ser Pro Leu Gln Asn Thr Ile
30   115   120   125

Leu Pro Gln Asn Gly Leu Phe Ile Val Pro Leu Ser Ala Lys Asn Asp
        130   135   140

35Glu Cys Leu Asn Ala Cys Val Glu Arg Leu Leu Phe Phe Leu Lys Ser
   145   150   155   160

Arg Gln Ser Asp Thr Tyr Lys Lys Tyr Ser Leu Ser Asp Thr Ala Pro
                165   170   175
40

Ile Leu Leu Asp Leu Ala Tyr Thr Leu Gln Val Ser Arg Glu Ala Met
          180   185   190

Thr Lys Arg Val Ala Phe Val Val Lys Thr Thr Ile Glu Leu Met Glu
5   195   200   205

Lys Leu Asn Ala Phe Ile Glu Lys Gln Asn Thr Ile Lys Ala Ser Asn
          210   215   220

10Ile Lys Gly Cys Tyr Tyr Ser Ser Thr Lys Thr Ser Ser Pro Phe Asp
    225   230   235   240

Asn Glu Ser Thr Asp
             245
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25gctggagtcg ttggtctgat caagacagca ttgtcgctgc agcaccgttt gttgcctccc 180
acgatcaact acgaagcacc caatcgggaa atcaattttg aacaatcacc ctttcatgtg 240
attgatgaac tcacggagtg gcggggtcaa ggtggaccac ttcgtgctgg tgtcagctcg 300
tttggaattg gt 312

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<213> Endobugula sertula
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Arg Leu Gly Asp Pro Ile Glu Leu Ala Ala Leu Ser Lys Ala Phe Glu
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40Glu Gly Thr Gln Arg Lys Gln Phe Cys Gly Ile Gly Ser Val Lys Ser

                    20   25   30

      Asn Ile Gly His Leu Asp Val Ala Ala Gly Val Val Gly Leu Ile Lys
              35   40   45
  5
      Thr Ala Leu Ser Leu Gln His Arg Leu Leu Pro Pro Thr Ile Asn Tyr
              50   55   60

      Glu Ala Pro Asn Arg Glu Ile Asn Phe Glu Gln Ser Pro Phe His Val
  10 65   70   75   80

      Ile Asp Glu Leu Thr Glu Trp Arg Gly Gln Gly Gly Pro Leu Arg Ala
                    85   90   95

  15Gly Val Ser Ser Phe Gly Ile Gly
                    100

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      <213> Endobugula sertula

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      cgcaaaaaca cctgtgccct cggctcggta aaaagcaata ttggccatac ctctgcggcc 120
      tctggtgtgg ctggtataca caaggtgctg ttatcgctta agcatcgaca attagtagcg 180
      agcctgcatt ttaatagcgc caatcaccac tttgattttc aacagtcgcc tttttatgtc 240
      aatacccagc taaggccctg ggatcaagca gagggactag aagaaagccg ccgccgggct 300
  30gcggtcagtt cttttggtgt cagt   324

      <210> 16
      <211> 108
  35<212> PRT
      <213> Endobugula sertula

      <400> 16
      Gln Leu Gly Asp Pro Ile Glu Leu Gln Ala Leu Ala Asp Val Tyr Arg
  40 1   5   10   15

```
Val Asp Asn Trp Arg Lys Asn Thr Cys Ala Leu Gly Ser Val Lys Ser
            20                  25                  30


    Asn Ile Gly His Thr Ser Ala Ala Ser Gly Val Ala Gly Ile His Lys
5           35                  40                  45


    Val Leu Leu Ser Leu Lys His Arg Gln Leu Val Ala Ser Leu His Phe
        50                  55                  60


10Asn Ser Ala Asn His His Phe Asp Phe Gln Gln Ser Pro Phe Tyr Val
    65                  70                  75                  80


    Asn Thr Gln Leu Arg Pro Trp Asp Gln Ala Glu Gly Leu Glu Glu Ser
                    85                  90                  95

15
    Arg Arg Arg Ala Ala Val Ser Ser Phe Gly Val Ser
                    100                 105
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  <213> Endobugula sertula

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    cagaaaaatc gtttgctggt cggatcagta aaagccaata ttagtcacct ggaagcagcc 120
    gggggtattt ctggactgat caaagcagta ctggcaatgc agcatggcgt gattccacag 180
    caattacact gcaaagaacc gagtcctcat atcccctgga aacgtctgcc tctcgatttg 240
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```
          1                    5                     10                       15

      Arg Gly Arg Asn Gln Lys Asn Arg Leu Leu Val Gly Ser Val Lys Ala
                      20                  25                  30
   5
      Asn Ile Ser His Leu Glu Ala Ala Gly Gly Ile Ser Gly Leu Ile Lys
                      35                  40                  45

      Ala Val Leu Ala Met Gln His Gly Val Ile Pro Gln Gln Leu His Cys
  10     50                  55                  60

      Lys Glu Pro Ser Pro His Ile Pro Trp Lys Arg Leu Pro Leu Asp Leu
         65                  70                  75                  80

  15Val Gln Glu Gln Thr Val Trp Pro Glu Ser Glu Glu Arg Ile Ala Ala
                      85                  90                  95

      Val Thr Ala Ser Asp
                    100
  20
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      acgacatacc ttggtgctgt aaaaagcaac ataggtcatg ccaacgcagg agcgggcatt 120
  30gctggtttta ttaaaacggt gctgtctctt taccatggca aaattgcacc caatgcaggc 180
      aataccgagc ccaatgcagc tttgaacctt gacgcgtttc attttgcatt accaaaaact 240
      ttgcttacat ggccggagtg tgatgttcga cgggcagcga tcagctcact gggttttggt 300


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  40<400> 20
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 1           5                   10                  15


Asp Ser Gln Ser Thr Thr Tyr Leu Gly Ala Val Lys Ser Asn Ile Gly
5           20                  25                  30


His Ala Asn Ala Gly Ala Gly Ile Ala Gly Phe Ile Lys Thr Val Leu
         35                   40                  45


10Ser Leu Tyr His Gly Lys Ile Ala Pro Asn Ala Gly Asn Thr Glu Pro
         50                   55                  60


Asn Ala Ala Leu Asn Leu Asp Ala Phe His Phe Ala Leu Pro Lys Thr
   65                   70                  75                  80
15
Leu Leu Thr Trp Pro Glu Cys Asp Val Arg Arg Ala Ala Ile Ser Ser
                 85                  90                  95


Leu Gly Phe Gly
20           100
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gttgcagctc tgattaaggc agttttggtt cttcaacatg gcgtggctcc ggccaatttg 180
cactgtcaca aattgaatcc gcttctggat atcgacggct tcaatgttgt gttcccgcag 240
tctgagaccc ccttgcacag ctctctgcag ctacttggcg ggtatcagtt cgttcgggtt 300
tggt                                                              304
35
```

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<210> 22
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40<213> Endobugula sertula
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<400> 22

```
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 1               5                   10                  15
```

```
5Pro Gly Arg Ser Ser Pro Leu Val Leu Gly Ala Leu Lys Ser Asn Ile
                20                  25                  30
```

```
   Gly His Leu Glu Ala Thr Ala Gly Val Ala Ala Leu Ile Lys Ala Val
            35                  40                  45
10
   Leu Val Leu Gln His Gly Val Ala Pro Ala Asn Leu His Cys His Lys
        50                  55                  60
```

```
   Leu Asn Pro Leu Leu Asp Ile Asp Gly Phe Asn Val Val Phe Pro Gln
15 65                   70                  75                  80
```

```
   Ser Glu Thr Pro Leu His Ser Ser Leu Gln Leu Leu Gly Gly Tyr Gln
                85                  90                  95
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```
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   gccggagtat ctggagtagt caaagtgtta ctcgctttga aacataagca acttccacct 180
   tcctgtcatc tggtgaaaat caatgagcat atcaaccttg aggacagtcc attttatatc 240
   aatacggcat taagaaatg ggaagtatcg gaaggtgagg ctcgcagggc cgcagtcagc 300
35tcgtttggtt cagc                                                    314
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Pro Tyr Thr Glu Lys Lys Asn Tyr Cys Ala Ser Gly Ser Val Lys Ser
                20   25   30

10Asn Ile Gly His Leu Thr Ala Ala Gly Val Ser Gly Val Val Lys Val
            35   40   45

Leu Leu Ala Leu Lys His Lys Gln Leu Pro Pro Ser Cys His Leu Val
        50   55   60

15

Lys Ile Asn Glu His Ile Asn Leu Glu Asp Ser Pro Phe Tyr Ile Asn
    65   70   75   80

Thr Ala Leu Lys Lys Trp Glu Val Ser Glu Gly Glu Ala Arg Arg Ala
20   85   90   95

Ala Val Ser Ser Phe Gly Ser
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25

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gtcgctggtc tcatcaagac ggtgatggca ctcaaggcgc gtcagatacc gcctagcttg 180
35cactttgaga cccccaatcc gcagatcgat tttgccgaca gtcccttta tgtaaataca 240
accttgaaag attggaacac caacggtgtt ccgcgccgcg cgggcgtgag ttcgtttggc 300
atcggt   306

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<213> Endobugula sertula

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 1               5                  10                  15
```

```
Thr Gln Lys Lys Lys Tyr Cys Ala Ile Gly Ser Val Lys Ser Asn Ile
10              20                  25                  30
```

```
Gly His Ala Asp Thr Ala Ala Gly Val Ala Gly Leu Ile Lys Thr Val
            35                  40                  45
```

```
15Met Ala Leu Lys Ala Arg Gln Ile Pro Pro Ser Leu His Phe Glu Thr
        50                  55                  60
```

```
Pro Asn Pro Gln Ile Asp Phe Ala Asp Ser Pro Phe Tyr Val Asn Thr
   65                  70                  75                  80
20
```

```
Thr Leu Lys Asp Trp Asn Thr Asn Gly Val Pro Arg Arg Ala Gly Val
                    85                  90                  95
```

```
Ser Ser Phe Gly Ile Gly
25          100
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<210> 27

<211> 309

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<213> Endobugula sertula

<400> 27

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gctggcattg ctggacttct caagatcgtc atggcgatga agcatcgtca actgccgccg 180
agcttgaatt ttgaaacacc aaatccagac ctggatctgg agaatagtcc gttcttcatc 240
cagacgaagc tgaaggattg ggaaagtgtg gggcctcgtc gtgccgcgtt gagttcgttt 300
ggtttgggt                                                       309
```
40

<210> 28

<211> 103

<212> PRT

<213> Endobugula sertula

5

<400> 28

Val Val Gly Asp Pro Ile Glu Val Val Gly Leu Thr Lys Ala Tyr Gln

1   5   10   15

10Ala His Thr Gln Glu Arg Gln Tyr Cys Gly Leu Gly Ser Val Lys Thr

            20   25   30

Asn Ile Gly His Thr Asp Ser Ala Ala Gly Ile Ala Gly Leu Leu Lys

        35   40   45

15

Ile Val Met Ala Met Lys His Arg Gln Leu Pro Pro Ser Leu Asn Phe

    50   55   60

Glu Thr Pro Asn Pro Asp Leu Asp Leu Glu Asn Ser Pro Phe Phe Ile

20 65   70   75   80

Gln Thr Lys Leu Lys Asp Trp Glu Ser Val Gly Pro Arg Arg Ala Ala

                85   90   95

25Leu Ser Ser Phe Gly Leu Gly

            100

<210> 29

30<211> 6000

<212> DNA

<213> Endobugula sertula

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<223> TAG may represent a transposase open reading frame

<220>

40<221> misc_feature

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<223> TTGAAA may be a possible -35 trascription control
      sequence


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  <222> (458)..(463)
  <223> GATAAT may be a possible -10 trascription control
        sequence
10
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  <221> misc_feature
  <222> (474)..(502)
  <223> ATCAATAAAAA and TTTTTATTGAT are inverted repeats
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  <221> misc_feature
  <222> (576)..(583)
  <223> TGAGGAAT may be a possible SD sequence
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  <221> misc_feature
  <222> (565)..(567)
  <223> ATG encoding M is presumptive start of PKS Open
25     reading frame


  <220>
  <221> misc_feature
  <222> (589)..(591)
30<223> GTG encoding V is is possible alternative start of
        PKS Open reading frame


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35ccagctaatc aacgaacaac aaaagcagca aacgggcaaa ctcatcagag ccttattgca 120
  ggtggattgt ttaagtattg atgaactcgg ttatatccca ttccctaaat ccggtggggc 180
  gttgctcttc cacctcatca gtaaacggta tgagaagacc agtattatca tcagcaccaa 240
  tctggctttt ggggaatgga acagtgtgtt tggtgatgcc aagatgacca ccgcgttatt 300
  ggatcgtatc acgcatcatt gttcaatcat cgaaaccaag catgcgtcgt atcgttttaa 360
40gcagagtcag aaacagacat gaaagtagct ttcaccggtg ggacagtgtt agatgcaaac 420
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     aaaataaaat ttttttattg attatgatga tccacgttaa aaaaaatact ataaatatga 540

     aataatattt caactttatt tttgatggtc gttgttgagg aatttttttgt gagttatcga 600

     gatattttga aggctttaca ggatgaaaaa attagttttg aagaggctaa atataagtta 660

   5ataaaaagaa aagataaaaa atcaaaacag cgtttaaatc atgatcgtga attaaatcga 720

     tcgatgaata ttacgccaaa aatagtgaat aattacggtt tagtattatt gggcggtcat 780

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     agcattcagg tcaaggcatc cgccattagt tttaccgata ccttgtgtgt acaaggttta 900

     tatccatcac actatccctt tgttccgggc tttgaagtat cgggagtgat tcgtcaagtg 960

  10ggtgaacaca taaccgactt acacgtgggt gatgaagtta ttgcgttcac aggatcatca 1020

     atgggagggc atgctgccta tgtgacggtg ccacaagatt acgtggtacg aaaacccaag 1080

     gacttatctt ttgaggatgc ctgtagcttc ccattggctt ttgcgaccgt ctatcacagt 1140

     tttgcacggg gaaaattatc tcacaacgat catatcttga tacaaacggc gacaggtggc 1200

     tgtggtttga tggcacttca gttggcgcgt ttaaagcagt gtgtgtgtta tgggacctcc 1260

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     gtcttaaata tgctcccagg agagcatata caacaagggc tgaatagttt agccaaggga 1440

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     tctctgcgtt ttaatcaatc cgttcaaacc atcaatttac tggggttact caataagggt 1560

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<223> N refers to any nucleotide
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<223> N refers to any nucleotide

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<222> (1)..(2672)

<223> N refers to any nucleotide

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15<212> DNA

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20<222> (1)..(2132)

<223> N refers to any nucleotide

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Ile Lys Arg Lys Asp Lys Lys Ser Lys Gln Arg Leu Asn His Asp Arg
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Glu Leu Asn Arg Ser Met Asn Ile Thr Pro Lys Ile Val Asn Asn Tyr
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Gly Leu Val Leu Leu Gly Gly His Leu Phe Glu Glu Leu Arg Leu Ser
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         85   90   95

Lys Ala Ser Ala Ile Ser Phe Thr Asp Thr Leu Cys Val Gln Gly Leu
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15

Tyr Pro Ser His Tyr Pro Phe Val Pro Gly Phe Glu Val Ser Gly Val
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Val Ile Ala Phe Thr Gly Ser Ser Met Gly Gly His Ala Ala Tyr Val
145   150   155   160

25Thr Val Pro Gln Asp Tyr Val Val Arg Lys Pro Lys Asp Leu Ser Phe
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Glu Asp Ala Cys Ser Phe Pro Leu Ala Phe Ala Thr Val Tyr His Ser
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Phe Ala Arg Gly Lys Leu Ser His Asn Asp His Ile Leu Ile Gln Thr
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Ala Thr Gly Gly Cys Gly Leu Met Ala Leu Gln Leu Ala Arg Leu Lys
35 210   215   220

Gln Cys Val Cys Tyr Gly Thr Ser Ser Arg Glu Asp Lys Leu Ala Leu
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    Leu Ala Lys Gly Gly Arg Tyr Leu Glu Leu Ser Met His Gly Leu Leu
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35   645   650   655

Leu Ser Val Asp Gly Arg Cys Phe Thr Phe Asp Gln Arg Ala Asn Gly
           660   665   670

40Phe Val Pro Gly Glu Gly Val Gly Val Val Leu Leu Lys Arg Met Ser

675   680   685

Asp Ala Val Arg Asp Gly Asp Pro Ile Arg Ala Val Ile Arg Gly Trp
    690   695   700

5
 Gly Val Asn Gln Asp Gly Arg Ser Asn Gly Ile Thr Ala Pro Ser Ser
 705   710   715   720

 Lys Ala Gln Ser Ala Leu Glu Gln Glu Val Tyr Gln Arg Phe Asn Ile
10   725   730   735

 Asp Pro Ser Ser Ile Thr Leu Val Glu Ala His Gly Thr Gly Thr Lys
       740   745   750

15 Leu Gly Asp Pro Ile Glu Val Glu Ala Leu Ala Glu Ser Phe Arg Val
      755   760   765

 Tyr Thr Asp Lys Arg His Tyr Cys Ala Leu Gly Ser Val Lys Ser Asn
    770   775   780

20
 Ile Gly His Leu Gly Val Gly Ala Gly Ile Ala Gly Val Thr Lys Val
 785   790   795   800

 Leu Leu Ser Leu Gln His Arg Met Leu Pro Pro Thr Ile His Cys Glu
25   805   810   815

 Asp Val Asn Pro Gln Ile Ala Leu Glu Gly Ser Pro Phe Tyr Ile Asn
      820   825   830

30 Thr Glu Leu Lys Pro Trp Gln Ser Gly Asp Ser Ile Pro Arg Arg Ala
      835   840   845

 Gly Val Ser Ser Phe Gly Phe Ser Gly Thr Asn Ala His Leu Val Leu
    850   855   860

35
 Glu Glu Tyr Leu Pro His Ser Thr Gly Thr Ile Glu Ser Phe Ala Ala
 865   870   875   880

 Asn His Ala Ser Thr Val Ile Ile Pro Leu Ser Ala Lys Ser His Asn
40   885   890   895

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     Ser Leu Tyr Thr Tyr Ala Gln Thr Leu Leu Ile Phe Leu Lys Arg Ser
             900               905               910


     Gln Val Thr Asp Ala Lys Lys Ile Thr Ile Asp His Met Glu Cys Arg
 5           915               920               925


     Leu Leu Asp Leu Ala Tyr Thr Leu Gln Val Gly Arg Glu Ala Met Asp
             930               935               940


 10Lys Arg Ile Ser Phe Ile Val Asn Thr Lys Gln Ala Leu Val Glu Lys
     945               950               955               960


     Leu Asn Ala Phe Leu Glu Lys Glu Lys Thr Ile Thr Asp Cys Tyr His
             965               970               975

 15
     Tyr Leu Phe Asp Ser Asp Lys Pro Ser Thr Glu Ile Phe Arg Leu Asp
             980               985               990


     Glu Asp Asp Lys Val Leu Ile Asn Ser Trp Ile Ser Gln Ser Gln Tyr
 20          995               1000              1005


     His Lys Leu Ala Glu Ala Trp Ser Gln Gly Leu Asp Ile Asp Trp Thr
         1010              1015              1020


 25Leu Leu Tyr Thr His Ser Ser Thr Pro Arg Arg Ile Ser Leu Pro Thr
     1025              1030              1035              1040


     Tyr Pro Phe Ala Arg Asp Arg Tyr Trp Leu Pro Glu Lys Pro Arg Tyr
                 1045              1050              1055

 30
     Asn Ala Ala Asn His Pro Val Ser Asn His Gln Thr Thr Thr Gln Asn
                 1060              1065              1070


     His Ser Arg Phe Ala Ile Asp Thr Asp His Asp Val Val Ala Glu Ile
 35          1075              1080              1085


     Met Gln Lys Thr His Gln Gln Glu Leu Glu Gln Trp Leu Leu Lys Leu
         1090              1095              1100


 40Leu Phe Val Gln Leu Gln His Met Gly Leu Phe Gln His Arg Val Phe
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          1105                1110                1115                1120

     Glu Thr Ala Thr Ala Leu Arg Gln Ser Ala Gly Ile Val Asp Lys Tyr
                    1125                1130                1135
   5
     Asp Arg Trp Trp His Glu Cys Leu Ser Val Leu Gln Asp Ala Gly Tyr
                1140                1145                1150

     Leu Glu Trp Lys Asp Asp Ser Val Ala Ala Ala Gln Ala Leu Glu Ser
  10      1155                1160                1165

     Glu Ser Gln Glu Ala Trp Trp Ser Arg Trp Asn Thr Glu Tyr Lys His
          1170                1175                1180

  15Tyr Gln Asn Asp Pro Glu Lys Lys Thr Leu Ala Ile Leu Ile Asn Asp
          1185                1190                1195                1200

     Cys Leu Gln Ala Leu Pro Gly Val Leu Ser Gly Glu Gln Leu Ile Thr
                    1205                1210                1215
  20
     Asp Ile Ile Phe Pro Asn Gly Ser Met Glu Lys Met Glu Gly Leu Tyr
                1220                1225                1230

     Lys Asn Asn Arg Ile Ala Asp Tyr Cys Asn Gln Cys Val Gly Asp Leu
  25      1235                1240                1245

     Leu Val Gln Phe Ile Glu Ala Arg Leu Ser Arg Asp Ala Asn Ala Arg
          1250                1255                1260

  30Ile Arg Ile Ile Glu Ile Gly Ala Gly Thr Gly Gly Thr Thr Ala Ile
          1265                1270                1275                1280

     Val Leu Pro Met Leu Gln Ala Tyr Gln Asp His Ile Asp Thr Tyr Cys
                    1285                1290                1295
  35
     Tyr Thr Asp Val Ser Lys Ala Phe Leu Met His Gly Gln Glu His Tyr
                1300                1305                1310

     Gly Glu Gln Tyr Pro Tyr Leu Ser Tyr Cys Leu Cys Asn Ile Glu Gln
  40      1315                1320                1325
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Asp Leu Val Ala Gln Gly Ile Ser Val Gly Asp Tyr Asp Ile Ala Ile
   1330   1335   1340

Ala Ala Asn Val Leu His Ala Thr Arg Asn Ile His Glu Thr Val Ser
51345   1350   1355   1360

His Val Arg Gln Ala Leu Ala Ala Asn Gly Leu Leu Ile Leu Asn Glu
       1365   1370   1375

10Phe Ser Gln Lys Ser Val Phe Ser Ser Val Ile Phe Gly Leu Ile Asp
         1380   1385   1390

Gly Trp Ala Leu Ser Glu Asp Thr Gly Leu Arg Ile Pro Gly Ser Pro
      1395   1400   1405
15
Gly Leu Tyr Pro Lys Gln Trp Gln Ala Val Leu Glu Ala Ser Gly Phe
   1410   1415   1420

Gly Asp Val Glu Phe Pro Leu His Asp Ala Arg Glu Leu Gly Gln Gln
201425   1430   1435   1440

Ile Ile Leu Ala Thr Asn Ala His Ala Asn Val Ala Ser Asp Leu Ala
        1445   1450   1455

25Thr Ser Val Ile Asp His Ala Pro Lys Arg Leu Pro Ser Ala Glu Val
      1460   1465   1470

Ser Met Asp Glu Arg Val Ser His Asp Ala Met Met Lys Ala Ser Val
     1475   1480   1485
30
Lys Gln Leu Leu Val Glu Gln Leu Ser Gln Ser Leu Lys Leu Asp Met
   1490   1495   1500

Asn Glu Ile His Pro Asp Glu Ser Phe Ala Asp Tyr Gly Val Asp Ser
351505   1510   1515   1520

Ile Thr Gly Ala Ser Phe Ile Gln Gln Leu Asn Asp Thr Leu Thr Leu
       1525   1530   1535

40Thr Leu Lys Thr Val Cys Leu Phe Asp His Ser Ser Val Asn Arg Leu

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              1540                    1545                    1550


    Thr Ala Tyr Leu Leu Ser Asp Tyr Gly Asp Asp Ile Ala Gln Trp Leu
            1555                1560                1565
   5
    Ala Thr Ala Pro Ala Leu Val Asp His Pro Gln Ser Val Val Ser Gln
       1570                1575                1580


    Val Leu Pro Glu Arg Ser Pro Ala Ser Thr Gln Ala Lys Pro Leu Pro
 101585                1590                1595                1600


    Ser Val Pro Pro Ser Leu Ser Met Glu Ser Pro Val Gln Gln Glu Ser
                1605                1610                1615


 15Ile Ala Ile Ile Gly Met Ser Gly Arg Phe Ala Ala Ser Glu Asn Leu
               1620                1625                1630


    Glu Ala Phe Trp Gln Gln Leu Ala Gln Gly Val Asp Leu Val Glu Pro
            1635                1640                1645
   20
    Ala Ser Arg Trp Gly Pro Gln Ala Glu Thr Tyr Tyr Gly Ser Phe Leu
       1650                1655                1660


    Lys Asp Met Asp Gln Phe Asp Pro Leu Phe Phe Asn Leu Ser Gly Val
 251665                1670                1675                1680


    Glu Ala Ser Tyr Met Asp Pro Gln Gln Arg Cys Phe Leu Glu Glu Ser
                1685                1690                1695


 30Trp Asn Ala Leu Glu Asn Ala Gly Tyr Val Gly Asp Gly Ile Glu Gly
               1700                1705                1710


    Lys Arg Cys Gly Ile Tyr Ala Gly Cys Val Ser Gly Asp Tyr Ala Gln
            1715                1720                1725
   35
    Leu Leu Gly Asp Gln Pro Pro Pro Gln Ala Phe Trp Gly Asn Ala Ser
       1730                1735                1740


    Ser Ile Ile Pro Ala Arg Ile Ala Tyr Tyr Leu Asn Leu Gln Gly Pro
 401745                1750                1755                1760
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Ala Thr Ala Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Val His
             1765   1770   1775

Leu Ala Cys Gln Ala Leu His Leu Asp Glu Met Glu Met Ala Leu Ala
5   1780   1785   1790

Gly Gly Val Ser Leu Tyr Pro Thr Pro Ile Ile Val Glx Val Phe Ala
      1795   1800   1805

10Trp Cys Arg Tyr
   1810